

AMENDMENTS TO THE DRAWINGS

In response to the objections to the drawings, replacement sheets 1-29 having improved line quality are attached. In addition, the replacement sheets include the following amendments.

In Figure 10, "44-BE" has been changed to "44-E".

In Figure 1N, "30-E" has been changed to "30".

In Figure 1N, "26-E" has been changed to "26".

In Figure 8F, "68AP" has been changed to "68A".

In Figure 11B, "28AP-B" has been changed to "28AP".

In Figure 11F, "49F" has been changed to "49E".

In Figure 12A, "14IP" has been changed to "14IT".

In Figure 17G, "20DT" has been changed to "20D".

In Figure 19C, "12T-PGA" has been changed to "12PGA".

In Figure 19D, "12T-PGA" has been changed to "12PGA".

In Figure 19E, "12T-PGA" has been changed to "12PGA".

In Figure 19F, "12T-PGA" has been changed to "12PGA".

In Figure 19F, "26PGA" has been changed to "26".

REMARKS

Objection to Title

The title has been objected to as being non descriptive. In response to this objection, the title has been amended. In addition, the specification has been checked for errors and the "Cross Reference To Related Applications" has been amended to include the latest information on the related applications.

Objection to Drawings

The drawings have been objected to because Figures 22a-22f are distorted. In response to this objection replacement sheets (Sheets 1-29) having improved line quality are attached to this Amendment.

The drawings have also been objected to because they include reference characters not in the description. Applicant appreciates the Examiner's diligence in locating these inconsistencies between the drawings and the specification. In response to these objections, the replacement sheets have been amended as follows. However, some of the objections are traversed as follows.

a) 44-BE (Figure 10). In response to this objection, 44-BE in Figure 10 has been changed to 44-E, which is initially described on page 32, line 5 of the specification.

b) 3A (Figure 2A). This objection is traversed. In Figure 2A, item 3A is a section line described on page 9, line 33, on page 15, line 33 and on page 17, line 16 of the specification.

c) 3B (Figure 2B). This objection is traversed. In Figure 2B, item 3B is a section line described on page 10, line 1, and on page 17, line 29 of the specification.

d) 3C (Figure 2C). This objection is traversed. In Figure 2C, item 3C is a section line described on page 10, line 3, and on page 18, line 10 of the specification.

e) 30-E (Figure 1N). In response to this objection, 30-E in Figure 1N has been changed to 30, which is initially described on page 19, line 2 of the specification.

f) 26-E (Figure 1N). In response to this objection, 26-E in Figure 1N has been changed to 26, which is initially described on page 18, line 6 of the specification.

g) 68AP (Figure 8E). In response to this objection, 68AP in Figure 8E has been changed to 68, which is initially described on page 34, line 32 of the specification.

h) 28AP-B (Figure 11B). In response to this objection, 28AP-B in Figure 11B has been changed to 28AP, which is initially described on page 42, line 27 of the specification.

i) 70A-A (Figure 11A). This objection is traversed as reference numeral 70A-A appears at page 44, lines 26-27 of the specification.

j) 49F (Figure 11F). In response to this objection, 49F in Figure 11F has been changed to 49E, which is initially described on page 47, line 4 of the specification.

k) 14IP (Figure 12A). In response to this objection, 14IP in Figure 12A has been changed to 14IT, which is initially described on page 47, line 12 of the specification.

l) 20DT (Figure 17G). In response to this objection, 20DT in Figure 17G has been changed to 20D, which is initially described on page 55, line 10 of the specification.

m) 17J (Figure 17I). This objection is traversed. In Figure 17I, item 17J is a section line initially described on page 14, line 11 of the specification.

n) 12T-PGA (Figure 19C). In response to this objection, 12T-PGA in Figures 19C, 19D, 19E and 19F has

been changed to 12PGA, which is initially described on page 59, line 9 of the specification.

o) 26PGA (Figure 19F). In response to this objection, 26PGA in Figure 19F has been changed to 26, which is initially described on page 18, line 6 of the specification.

Rejections Under 35 USC §103

Claims 170-175 have been rejected under 35 USC §103(a) as being obvious over Kinsman et al. (US Patent No. 6,717,245) in view of Liu et al. (US Patent No. 6,841,413) and Wakabayashi et al. (US Patent No. 6,607,970).

Claims 176 and 177 have been rejected under 35 USC §103(a) as being obvious over Kinsman et al. (US Patent No. 6,717,245) in view of Liu et al. (US Patent No. 6,841,413), Wakabayashi et al. (US Patent No. 6,607,970) and Farnworth et al. (US Patent No. 6,620,731).

Claim 179 has been rejected under 35 USC §103(a) as being obvious over Kinsman et al. (US Patent No. 6,717,245) in view of Liu et al. (US Patent No. 6,841,413), Wakabayashi et al. (US Patent No. 6,607,970) and Gilleo et al. (US Patent No. 6,228,678).

The rejections under 35 USC §103 are traversed for the reasons to follow.

Summary of the Invention

Claims 170-179 are directed to a semiconductor component 16 (Figures 4A-4C and 1K) including a thinned semiconductor die 10T (Figure 4C) having a circuit side 20 (Figure 4C), a thinned back side 22T (Figure 4C), and a plurality of peripheral edges 30 (Figure 4C). The component 16 (Figures 4A-4C) also includes a first polymer layer (circuit side polymer layer 36P (Figure 4C) and edge polymer layers 40 (Figure 4C)) covering the circuit side 20 and the edges 30. The component 16 (Figures 4A-4C) also

includes a second polymer layer (back side polymer layer 38P (Figure 4C)) covering the back side 22T.

The component 16 (Figures 4A-4C) also includes a plurality of die contacts 18 (Figure 4C) on the die 10T, and a plurality of contact bumps 24P (Figure 4B) on the die contacts 18 embedded in the first polymer layer 36P (Figure 4C). The component 16 (Figures 4A-4C) also includes terminal contacts 42 (Figure 4C) on the contact bumps 24P.

As shown in Figure 8F, the component can also include conductive vias 70A (Figure 8F) in electrical communication with the die contacts 18, and terminal contacts 42A (Figure 8F) on the conductive vias 70A.

Argument

The 35 USC §103 rejections are traversed because the cited combination of references does not disclose or suggest a component having the presently claimed combination of features. However, the claims have been amended to further emphasize this undisclosed combination of features. The rejections under 35 USC §103 are further traversed because one skilled in the art at the time of the invention would have no incentive to combine the references in the manner of the Office Action.

In assessing unobviousness the Examiner is asked to view the claims "as a whole", from the standpoint of one skilled in the art at the time of the invention. The presently claimed semiconductor component has a chip scale outline, and includes a thinned semiconductor die encapsulated on six sides by only two polymer layers (i.e., a first polymer layer and a second polymer layer in the claims). In addition, the first polymer layer encapsulates bump contacts on die contacts of the thinned die.

In the 35 USC §103 rejections of claims 170-179, Kinsman et al. was cited as teaching a semiconductor substrate 10 having intermediate conductive elements 20 encapsulated by an encapsulant 30 on the circuit side. In

addition, the encapsulant 30 also covers the backside of the semiconductor substrate 10. However, Kinsman et al. does not disclose that the semiconductor substrate 10 is a thinned die encapsulated on six sides by polymer layers. Kinsman et al. thus does not recognize the basic concept of a chip scale component that includes a thinned die encapsulated on six sides.

Liu et al. was cited as teaching a thinned die 200 (Figure 3). However, in Liu et al. the thinned die 200 is attached to a heat spreader 102 (Figure 3). As shown in Figure 9 of Liu et al., the heat spreader 102 is much larger than the thinned die 200, such that the completed component does not have a chip scale outline. Liu et al. also does not recognize the concept of a chip scale semiconductor component which includes a thinned die encapsulated on six sides.

Wakabayashi et al. was cited as teaching a semiconductor device 15 (Figure 10) having a seal film 13 (polymer layer) on the circuit side and edges 1a of a die 1' (Figure 10). As with the previous references, Liu et al. does not recognize the concept of a chip scale semiconductor component which includes a thinned die encapsulated on six sides.

To further emphasize this combination of features, independent claim 170 has been amended to recite "a chip scale component". Antecedent basis for this recitation is contained on page 3, line 28 of the specification. Amended independent claim 170 also recites "the first polymer layer and the second polymer layer encapsulating the die on six sides". Antecedent basis for this recitation is contained on page 5, lines 18-22, and on page 29, lines 23-24 of the specification.

Amended independent claim 170 also recites "the component has an outline equal to that of the die plus the selected thickness of the first polymer layer on each peripheral edge". Antecedent basis for this recitation is

contained on page 2, lines 13-16, of the specification, which states that a chip scale package "has an outline or "footprint", that is about the same as the outline of the die contained in the package." In addition, page 28, lines 8-9 of the specification provide antecedent basis for the selected thickness recitation. Dependent claim 171 has been amended to state that the selected thickness is about 1 mil. Antecedent basis for this recitation is contained on page 28, line 9 of the specification.

The 35 USC §103 rejections are based on the premise that the prior art shows each claimed feature of the present component. However, the prior art does not show all of these features in combination. The component "taken as a whole" is therefore submitted to be unobvious over the combination of references. See for example Jones v Hardy, 727 F.2d 1524, 220 USPQ 1021 (Fed Cir. 1984, on assessing the invention "as a whole".

Further, there would be no incentive to combine the references because the prior art does not recognize the concept of a chip scale semiconductor component which includes a thinned die encapsulated on six sides. In regard to the incentive to combine Akram et al. and Liu et al., the Office Action states: "It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a thinned die as disclosed in Liu because it aids in providing easier formation for build up layers (For example: See column 2 Lines 58-60)."

However, the build up layers described at column 4, lines 25-30 of Liu et al. are for attaching a heat spreader 102 to the backside of the thinned die 200. The presently claimed component does not include a heat spreader, but rather is encapsulated on six sides including an insulating layer on the back side of the thinned die. The proposed motivation for the combination of Akram et al. and Liu et al. would thus not be apparent to one skilled in the art at

the time of the invention. Further, build up layers and a heat spreader would defeat the primary features of the present component of a thinned component encapsulated on six sides.

Similarly, the proposed motivation for the combination of Wakabayashi et al. and Akram et al. would not be apparent to one skilled in the art at the time of the invention. In this regard, the Office Action states: "It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor component of Kinsman to include a polymer layer that covers the edges as disclosed in Wakabayashi because it aids in preventing water or moisture from entering (For Example: See Column 4 Lines 35-43)."

However, the cited passage in Wakabayashi et al. further states that the moisture is prevented "from entering the interface between the insulating film 3 (protective film) and the seal film 13." As seen in Figure 2 of Kinsman et al., this interface is already protected by the encapsulant 30 (Figure 3) in the channels 26.

With respect to the product by process limitation "planarized" in claims 174 and 175, this limitation has been removed, and replaced by the structural limitation "planar surface".


With respect to the 35 USC §103 rejections of claims 176 and 177, over Farnworth et al., claim 176 has been amended to recite "a plurality of conductive vias in the thinned die". Admittedly, Farnworth et al. discloses conductive vias in a die. However, a component having conductive vias in a thinned die, in combination with the previously noted features, is submitted to be unobvious over the art.

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 170-179 is respectfully requested. An IDS with the issued parent case is being submitted concurrently with this Amendment. Should any issues arise that will advance this case to allowance, the Examiner is asked to contact the undersigned by telephone.

DATED this 10th day of November, 2005.

Respectfully submitted:

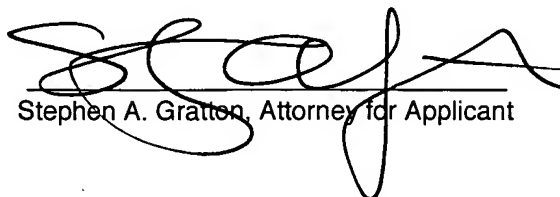

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November 10, 2005
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Stephen A. Gratton, Attorney for Applicant